

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE SEP 2007		2. REPORT TYPE Annual		3. DATES COVERED 00-00-2007 to 00-00-2007	
4. TITLE AND SUBTITLE The Acoustical Oceanography Of Bubbles: URI Component				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) University of Rhode Island, Graduate School of Oceanography (educational), Narragansett, RI, 02882				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT To develop a comprehensive account of the acoustical oceanography of bubbles in the ocean, including their formation, evolution and decay, their response to different oceanographic conditions, their contribution to passive sound in the sea, and their influence on acoustical propagation.					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 2	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

The Acoustical Oceanography of Bubbles: URI Component

David M. Farmer
Graduate School of Oceanography (educational)
University of Rhode Island
Narragansett, RI 02882
Phone: (401) 874-6222 fax (401) 874-6889 email: dfarmer@gso.uri.edu

Award Number: N000140410295

LONG-TERM GOALS

To develop a comprehensive account of the acoustical oceanography of bubbles in the ocean, including their formation, evolution and decay, their response to different oceanographic conditions, their contribution to passive sound in the sea, and their influence on acoustical propagation.

OBJECTIVES

To write a monograph that will be of practical value to ocean acousticians and others concerned with bubbles in the sea. The monograph will include both oceanographic aspects and acoustical implications. The oceanographic discussion will cover bubble formation and injection and the response of bubble clouds to subsurface circulation, buoyancy effects and dissolution. The discussion of acoustical implications will cover the contribution of bubble formation to naturally occurring sound in the sea, the role of bubbles in scattering and absorbing sound, the acoustical characteristics of bubble plumes and clouds including the consequences of the evolution, and approaches to incorporating bubbles in acoustical propagation modeling.

APPROACH

This is a collaborative effort being undertaken jointly with Dr Grant Deane of Scripps Institution of Oceanography. Our approach is to develop the overall focus of the monograph, identify topics to be covered and develop a plan for the contents of each chapter, followed by preliminary sketches of each chapter followed by detailed writing.

WORK COMPLETED

Our effort this year has focused on writing sections on the behaviour of individual bubbles in the ocean, including the effects of surfactants, gas transfer mechanisms, turbulence, buoyancy effects, dissolution, escape and crevice stabilization, resonance, scattering, absorption, damping and boundary effects. Following an introductory chapter on the scientific motivation for studying bubbles, current chapters include discussion of bubble creation, isolated bubble processes, collective bubble dynamics, acoustical characteristics of bubble clouds, naturally occurring bubble populations, propagation and ambient sound topics.

IMPACT/APPLICATIONS

Bubbles have a profound impact on the upper ocean acoustical environment. Calculations requiring a knowledge of this environment, both with respect to naturally occurring sound and with respect to propagation such as sonar operations of various kinds, depend on a knowledge of bubble distributions and their oceanographic and acoustical behavior. This monograph is intended to summarize available knowledge on this topic and provide the theoretical framework required for relevant acoustical modeling.

RELATED PROJECTS

Acoustical Oceanography of Bubbles: SIO Component